

WHAT CAUSES ANTHRACOFIBROSIS? EITHER TUBERCULOSIS OR SMOKE

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ABSTRACT

Objective: To define the prevalence of anthracofibrosis in fiberoptic bronchoscopy of highly suspected patients who were likely to have pulmonary tuberculosis but they had three times negative sputum exams for acid-fast bacilli and to determine the association of anthracofibrosis with tuberculosis and prolonged smoke exposure.

Methodology: The fiberoptic bronchoscopy was done in 207 patients; 106 male and 101 female their age was from 15 to 91 years and most of them were referred by the professors of infectious diseases. Exact medical history was taken and specially focused on the past medical history of tuberculosis and chronic exposure to any kind of smoke. Then they were divided into two groups, with or without anthracofibrosis, and then this data was analyzed among the two groups

Results: Anthracofibrosis was diagnosed in 34 cases (19 female, 15 male). Past medical history of pulmonary tuberculosis was positive in 45 patients (26 males and 19 females) and Seventy one patients (38 female, 33 male) had positive history of prolonged exposure to smoke but, the most common cause of smoke exposure in females was the cooking of bread in the traditional clay oven (92 percent) and smoking in males (96 percent).

Conclusions: The finding of this study suggests that the incidence of active or old tuberculous infection was significantly higher in anthracofibrosis group in males as well as females. Although prolonged smoke exposure was significantly higher in anthracofibrosis group but, this relationship was just true in females.

KEY WORDS: Anthracofibrosis, Bronchoscopy, Tuberculosis, Smoke, Oven.

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INTRODUCTION

Dark anthracotic pigmentation on overlying mucosa in conjunction with bronchial narrowing or obliteration which is named as anthracofibrosis by some authors is a bronchoscopic finding. Establishing the origin of anthracotic pigments and the cause for bronchial stenosis in each patient is difficult. Nevertheless, several findings indicate that bronchial tuberculosis is one of the most likely causes for the development of bronchial anthracofibrosis. It is mentioned that anthracofibrosis is caused by a fibrotic response to active or old tuberculous infection and has

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no association with pneumoconiosis or smoking.¹⁻⁴ Because carbon is inert and inhaled anthracotic particles alone did not induce focal bronchial abnormality in patients. Nevertheless, in patients without a history of tuberculosis, previously injured bronchial mucosa with an accumulation of anthracotic pigment from air pollutants or smoke might subsequently undergo healing and fibrosis resulting in anthracofibrosis.⁵ Perforation of a tuberculous lymph node into the bronchus may develop insidiously and the healing process may appear without apparent clinical symptoms in the aged population.⁶

The black pigments in the bronchial wall might be derived from anthracotic material in the adjacent lymph nodes, which might subsequently be incorporated into the scarred area of the bronchus. The involved lymph nodes, however, may perforate into the adjacent bronchi, and carbon particles in the lymph nodes may penetrate through the bronchial wall as deep as the mucosa, resulting in coloring of the bronchial mucosa. Subsequently, healing with fibrotic response may occur in the bronchi, resulting in bronchial narrowing or obstruction with anthracotic pigmentation.¹ Stradling⁷ and Abraham⁸ described the appearance of anthracotic deposits in the bronchial mucosa after intrabronchial perforation of tuberculous lymph nodes. Although some of these studies suggest anthracofibrosis is a unique presentation of active tuberculosis and appropriate anti tuberculous medications should be started promptly, Soo-taek Uh and coworkers do not approve this strategy.⁹

Zahedan is the center of Sistan and Balochestan province in Iran with the highest rate of tuberculosis contamination. The notification of tuberculosis in Sistan & Balochestan was 135/100000 population in 2002. Sistan & Balochestan is one of the 30 provinces of Iran in the southeast of country, bordering Pakistan and Afghanistan and one of the most undeveloped, desolate and poor region in Iran.^{10,11} In this prospective study we wanted to assess the prevalence of anthracofibrosis in highly suspected patients in the Zahedan city who

were likely to have pulmonary tuberculosis but we could not find any acid-fast bacilli in three times of sputum exams. We also wanted to study the prevalence of tuberculosis and exposure to any kind of heavy smoke in this group.

METHODOLOGY

This was a prospective study conducted from September 2003 to April 2006 in which Fibroptic bronchoscopy was done on 207 patients who were highly suspected to have pulmonary tuberculosis; however, they had three negative sputum exams for acid-fast bacilli. Most of the patients were referred to us by the professors of infectious diseases. Diagnosis of anthracofibrosis was made solely on the basis of bronchoscopic findings. Patients in whom bronchoscopy revealed definite narrowing or obliteration of lobar or segmental bronchi with anthracotic pigmentation in the surrounding mucosa were considered to have anthracofibrosis and an effort was made to take a biopsy from the anthracofibrosis in these patients if it was possible. Bronchoalveolar lavage (BAL) was obtained in all of patients and the samples were sent to two different medical laboratories.

Exact medical history was taken from all of the cases and we specially focused on the past medical history of tuberculosis and chronic exposure to any kind of smoke such as the one from bread cooking in the traditional clay oven that is very common in this region. Chest CT scan was done in all patients with anthracofibrosis. Then they were divided into two groups, with or without anthracofibrosis. The incidence of pulmonary tuberculosis and positive exposure to any kind of smoke was analyzed among the two groups. We used ki-square tests for statistical analysis with SPSS version14 software and P value < 0.05 was used to define statistical significance.

RESULTS

Among the total 207 patients (106 males, 101 females) who underwent bronchoscopy, the average age was 58.9 years for males and 55.2

for females. Seventy one patients (38 female, 33 male) had positive history of prolonged exposure to smoke; moreover, the most common cause of smoke exposure in females was the cooking of bread in the traditional clay oven (92 percent) and smoking in males (96 percent). Past medical history of pulmonary tuberculosis was positive in 45 patients (26 males and 19 females) all of whom had already received antituberculous chemotherapy at least for more than six months.

Anthraxofibrosis was diagnosed in 34 cases (19 female, 15 male). Although anthracofibrosis bronchoscopic biopsy was possible in 21 patients (12 females, 9 males), histologic examination of biopsy specimen revealed chronic granulomatous inflammation consistent with active tuberculosis in only 5 patients (four males, one female), all of whom had past medical history of pulmonary tuberculosis and three of them had also prolonged exposure to smoke. In another patient with anthracofibrosis and lung mass who was highly suspected to have malignancy, thoracotomy and lung resection was done and pathologist report showed caseous granulomatous lesion consistent with active tuberculosis. Bronchoalveolar lavage was positive for acid-fast bacilli just in two non anthracofibrosis patients and in four other patients in this group had lung cancer (three cases Squamous Cell Carcinoma of lung and one case Adenocarcinoma) were diagnosed in bronchoscopy and endobronchial lesion biopsy.

In anthracofibrosis group the average age was 61.8 years while it was 56.2 years in non anthracofibrosis group. Active or old tuberculous infection was detected in 15 cases out of 34 anthracofibrosis patients group and in the 30 cases of 173 non anthracofibrosis patients group. Chronic exposure to smoke was found in 52 percent (18/34) of anthracofibrosis group and 30 percent (53/173) of non anthracofibrosis group.

In anthracofibrosis patients the most common chief complaint was chronic cough (25/34) and exertional dyspnea (16/34). On chest CT scan, abnormal radiological findings were

observed in all of these patients; Hilar or interlobar lymphadenopathy (calcified or non calcified) in 27 patients (15f, 12m), collapse of right middle lobe in 14 patients (10f, 4m) and lung mass in 8 patients (5 Males, 3 Females). In bronchoscopy, right middle lobe bronchus was most frequently involved (18 cases; 11 females and 7 males), followed by the right upper lobe bronchus (16 cases; 10 females and 6 males) and left upper lobe bronchus (15 cases; 7 Females and 8 Males).

DISCUSSION

Many research scientists believed that anthracofibrosis is caused by a fibrotic response to active or old tuberculous infection and it has no association with pneumoconiosis or smoking.¹⁻⁴ On the other hand, indoor air smoke resulting from burning of biomass fuels (coal, wood, animal dung...) is an important risk factor for chronic lung diseases in developing countries, especially for women who work in a closed smoky cooking area.^{12,13}

It has been revealed that the risk of acute respiratory tract infections, chronic obstructive lung disease, cancer and tuberculosis is increasing in conjunction with the use of these kinds of fuels.¹³⁻¹⁴ Amoli reported that other bronchopulmonary disorders like anthracosis in patients with no history of smoking or occupational dust exposure and stenosis, or obliteration of the lobe and segment orifices due to anthracosis could be related to biomass usage in Iranian housewives who are chronically exposed to indoor smoke.¹⁵ Törün et al believe that bronchial anthracostenosis is a clinical presentation caused by biomass exposure in Turkey and they showed it was encountered most commonly in older females.¹⁶ This study showed that the average age of anthracofibrosis group was significantly higher than non anthracofibrosis group (PV=0.012). The incidence of active or old tuberculous infection was significantly higher in anthracofibrosis group. (PV= 0.001) and it was true in both sex (for females PV=0.046 and for males PV= 0.009).

Although prolonged smoke exposure was significantly higher in anthracofibrosis group (PV=0.017), this relationship was true in females with anthracofibrosis while, in males anthracofibrosis patients smoke exposure was not significantly higher than non anthracofibrosis males. (PV=0.453) The most common cause of smoke exposure in females was the cooking of bread in the traditional clay oven (92 percent) and smoking in males (96 percent). Thirty- five women in our study had a history of working in a closed smoky cooking area, where coal or firewood was used as the major heat source, anthracofibrosis could be found in 19 of them. Although almost of anthracotic pigmentation is removed by normal pulmonary dust-ridding mechanisms, including ciliary action and bronchial mucus, but some can be retained by macrophages in dust sumps located at branching sites of the terminal and respiratory bronchioles and possibly in the bronchial mucosa which is injured after chronic exposure to hot and smoky air due to bread cooking in the traditional clay oven and finally fibrosis will develop in this injured anthracotic mucosa that is constantly irritated by this hot and smoky air. This study shows that anthracofibrosis is not a unique presentation of active tuberculosis and anti-tuberculosis drugs should not be started promptly without any strong microbiological evidence.

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